What Is Claimed Is:

1. A method of transmitting eight times a base data rate within a spectral range of 10 times the data rate comprising the steps of:

modulating first and second pairs of data streams onto respective first and second non-overlapping data bands in QRZ format;

modulating third and fourth pairs of data streams onto respective third and fourth non-overlapping data bands in QRZ format; and

forcing the second and third data bands into orthogonal polarization states;

wherein each of the data streams has the base data rate, and the second and third data bands are adjacent in frequency.

2. The method of claim 1, further comprising the steps of:

forcing the first and second data bands into a first polarization state; and

forcing the third and fourth data bands into a second polarization state, the second polarization state being orthogonal to the first polarization state;

wherein the second data band is adjacent on a first side to the first data band, and adjacent on a second side to the third data band, and the third data band is adjacent on a first side to the second data band, and adjacent on a second side to the fourth data band.

3. The method of claim 1, further comprising the steps of:

forcing the first and third data bands into a first polarization state; and

forcing the second and fourth data bands into a second polarization state, the second polarization state being orthogonal to the first polarization state;

wherein the second data band is adjacent on a first side to the first data band, and adjacent on a second side to the third data band, and the third data band is adjacent on a first side to the second data band, and adjacent on a second side to the fourth data band.

4. The method of claim 1, further comprising the step of:

sharpening a duration of pulses used to modulate the data streams into QRZ format.

5. A method of transmitting sixteen (16) times a base data rate within a spectral range of 10 times the base data rate comprising the steps of:

modulating a first set of four pairs of data streams in a pulse-sharpened QRZ format into a first signal, the first signal having a first set of four data bands in the frequency domain;

modulating a second set of four pairs of data streams in a pulse-sharpened QRZ format into a second signal, the second signal having a second set of four data bands in the frequency domain;

delaying the second signal by one pulse slot with respect to the first signal in the time domain; and

interleaving the first signal and the second signal in the time domain.

6. The method of claim 5, wherein adjacent data bands in the first signal have orthogonal polarization states, and adjacent data bands in the second signal have orthogonal polarization states.

7. A method of reducing effects of amplified spontaneous emission in reception of a QRZ data signal comprising the steps of:

in a receiver, generating a local carrier signal; and

pulsing the local carrier signal such that a power of the local carrier signal goes to zero during data symbols transition of the QRZ data signal.

8. The method of claim 7, wherein the local carrier signal is generated by a laser located within the receiver.

9. The method of claim 7, further comprising:

mixing the pulsed carrier with the data signal at a detector;

10. The method of claim 7, further comprising the step of:

detecting a pulse polarity of the QRZ data signal, the QRZ data signal pulse having an offset in amplitude, the offset distinguishing positive and inverse phases of the signal pulse.

11. The method of claim 10, wherein the offset varies over time.

12. A method of amplifying a first signal with respect to a second signal in a fiber amplifier without generating interferometric fringing between the first and second signals, the method comprising the steps of:

counterpropagating the first signal and the second signal through the fiber amplifier to match optical path lengths of the first and second signals; and

attenuating the second signal before and after amplification in the fiber amplifier to reduce amplification effects of the fiber amplifier by a controlled amount.

13. The method of claim 12, wherein the fiber amplifier is an Erbium-doped fiber amplifier (EDFA).

14. A method of doubling a data rate of a received multi-channel data signal to a detector comprising the steps of:

generating upper and lower side carrier signals from carrier signals within the multi-channel data signal, the upper and lower side carrier signals centered in data bands of the data signal;

pulsing the side carrier signals at the data rate with a pulse having a reduced width;

demultiplexing the upper and lower side carrier signals;

delaying at least one of the upper and lower side carrier signals with respect to

the other side carrier signals; and

multiplexing and interleaving the undelayed and delayed carrier signals into a single carrier signal stream for mixing with the data signal.

15. The method of claim 14, further comprising the step of:

after pulsing, sharpening the pulsed side carrier signals at a doubled rate;

16. A method of canceling phase noise in a received QRZ signal comprising:

splitting the received signal into a first signal traveling on a first optical path and second signal traveling on a second optical path;

in the second optical path, delaying the second signal;

combining the first and second signals; and

at a detector, mixing the first signal with the second signal.

17. A method of reducing nonlinear effects in optical communication comprising the step of:

transmitting, over an optical fiber, an optical data signal including carrier signals and data bands in which the carrier signals are set to a first polarization state and the data bands are set to a second polarization state orthogonal to the first polarization state.

18. The method of claim 17, further comprising the step of:

at a receiver, fixing a polarization state of the transmitted optical data signal; and

separating the carrier signals from the data bands of the transmitted optical data signal by differential routing of their respective polarization states.

19. The method of claim 18, further comprising the step of:

compensating for the differential effects of PMD on the carrier signals vis a vis the data bands by optically delaying the carrier signals after their separation from the data bands.

20. The method of claim 18, further comprising the steps of:

mixing the carrier signals with the data bands, outputting I,Q constellations; and

after mixing, compensating for the differential effects of PMD on the carrier signals vis a vis the data bands in the electronic domain by rotation of the I,Q constellations.

21. The method of claim 20, further comprising the step of:

generating a local carrier signal in at the receiver.

22. The method of claim 21, wherein the local carrier signal is generated by a laser located within the receiver.

23. A method of rotating an I,Q constellation in the electronic domain comprising the steps of:

applying sinusoid attenuation functions to input I and Q data streams, resulting in modified I and Q data streams; and

depending on a required rotation angle, inverting the modified I and Q data streams.

24. A method for compensating for phase noise, chromatic dispersion and high order PMD effects electronically comprising:

receiving a set of I and Q data streams;

in a first stage, compensating for frequency-independent phase noise and outputing to a second stage; and

in a second stage, compensating for frequency dependent chromatic disperion and high order PMD effects.

25. The method of claim 24, further comprising:

in the first stage:

attenuating input data streams;

summing attenuated input data streams algebraically, deriving sum and difference streams; and

outputting the sum and difference streams to a second stage; and

in the second stage:

applying frequency filters to received data streams; and

combining and outputting filtered data streams as a function of frequency.

26. A method of QRZ data modulation comprising the steps of

clocking a first data signal and an inverted data signal using gates;

outputting non-inverted and inverted versions of both the clocked data signal and the clocked inverted data signal;

combining the output signals into a combined signal;

inputting the combined signal to a modulator operated in push pull mode; and

inputting a second data signal to a second modulator, the second data signal having first and second portions, the second portion shifted 90 degrees in phase with respect to the first portion.

27. The method of claim 26, wherein the first and second modulators are combined in a single modulator having a dual drive input, the method further including the steps of:

providing the combined signal in differential mode; and

providing the second data signal in common mode.

28. A method of generating a plurality of equally spaced wavelengths comprising:

a) generating amplified spontaneous emission;

b) filtering the amplified spontaneous emission using at least one high-Q filter;

c) reamplifying the filtered amplified spontaneous emission; and

d) repeating steps b) and c) up to a threshold number of repetitions.

29. The method of claim 28, wherein the amplified spontaneous emission is reamplified through passing in a direction through a bi-directional fiber amplifier and the at least one high-Q filter is a Fabry-Perot filter.

30. The method of claim 28, wherein the amplified spontaneous emission is reamplified in either one of two principal polarization states of a polarization maintaining bi-directional fiber amplifier and the at least one high-Q filter is a Fabry-Peropt filter.

31. A reflective modulator comprising:

at least one optical path, the at least one optical path, the at least one optical path including at least one reflection; and

at least one transmission line, each carrying electrical modulation signals along one of the at least one optical path, the at least one transmission line having a turned section for reuse of the electrical modulation signals.

32. The reflective modulator of claim 31, wherein the at least one optical path has a first length and the at least one transmission line has a second length, the first length being greater than the second length.